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APPENDIX C

LABORATORY DATA QUALITY ASSURANCE REVIEWS AND ANALYTICAL SUMMARY SHEETS

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ecology and environment, inc.

101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537

International Specialists in the Environment

MEMORANDUM

DATE: March 1, 1989

TO: John Roland, TATM-Project Manager, E & E, Seattle, WA

FROM: Doug Gresham, TATM-Chemist, E & E, Seattle, WA *DG*

THRU: Michael Bray, TATM-Chemist, E & E, Seattle, WA *(MB)*

SUBJ: Total Organic Carbon Data Quality Assurance Review, TOSCO Corporation-Spokane Terminal

REF: TDD: T10-8812-006
PAN: TWA-0256-AAA

Ecology and Environment, Inc. received data summary sheets for 11 water samples collected from the TOSCO Corporation site in Spokane, Washington. Total organic carbon (TOC) analyses were performed by Columbia Analytical Services, Inc., Longview, Washington.

The water samples were numbered: T8120022 through T8120032.

The lab analyzed a laboratory control sample (EPA WP687) with a true value of 41.0 mg/l. The lab result (37.5 mg/l) had a percent recovery of 91%, which in this reviewer's opinion is acceptable.

The lab analyzed sample number T8120029 in duplicate and both results were below the instrument detection limit of 5 mg/l. Therefore, the relative percent difference between the values cannot be calculated.

No additional information was available, consequently additional quality assurance review cannot be performed. Based on the information provided the data are acceptable for use.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/13/89
DATE ANALYZED: 01/20/89
WORK ORDER #: 89072

TOC
EPA Method 415.1/Modified
mg/L

<u>Sample Name</u>	<u>Lab Code</u>	<u>Estimated MDL</u>	<u>TOC</u>
T8120022	072-1	5	ND
T8120023	072-2	5	7.5
T8120024	072-3	5	ND
T8120025	072-4	5	ND
T8120026	072-5	5	ND
T8120027	072-6	5	ND
T8120028	072-7	5	68

MDL means Method Detection Limit
ND means None Detected

Approved by Don Williams Date 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/14/89
DATE ANALYZED: 01/16/89
WORK ORDER #: 89084

TOC
EPA Method 415.1/Modified
mg/L

<u>Sample Name</u>	<u>Lab Code</u>	<u>Estimated MDL</u>	<u>TOC</u>
T8120029	084-1	5	ND
T8120030	084-2	5	ND
T8120031	084-3	5	ND
T8120032	084-4	5	ND

MDL means Method Detection Limit
ND means None Detected

Approved by Dave Edelman, / Date 2/10/89



ecology and environment, inc.

101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537

International Specialists in the Environment

MEMORANDUM

DATE: March 1, 1989

TO: John Roland, TATM-Project Manager, E & E, Seattle, WA

FROM: Doug Gresham, TATM-Chemist, E & E, Seattle, WA DG

THRU: Michael Bray, TATM-Chemist, E & E, Seattle, WA MB

SUBJ: Total Organic Halogens Data Quality Assurance Review, TOSCO Corporation-Spokane Terminal

REF: TDD: T10-8812-006
PAN: TWA-0256-AAA

Ecology and Environment, Inc. received data summary sheets for 11 water samples collected from the TOSCO Corporation site in Spokane, Washington. Total organic halogens (TOX) analyses were performed by Columbia Analytical Services, Inc., Longview, Washington.

The water samples were numbered: T8120022 through T8120032.

The lab analyzed two method blanks with the samples and there were no contaminants found above the instrument detection limit of 5 ug/l.

The lab spiked sample number T8120028 and the percent recoveries of the matrix spike (90%) and matrix spike duplicate (98%) are acceptable in this reviewer's opinion.

No additional information was available, consequently additional quality assurance review cannot be performed. Based on the information provided the data are acceptable for use.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/12-13/89
DATE ANALYZED: 01/13/89
WORK ORDER #: 89072

Total Organic Halogens (TOX)
EPA Method 9020
ug/L (ppb)

<u>Sample Name</u>	<u>Lab Code</u>	<u>Estimated MDL</u>	<u>Measured Concentration</u>
T8120022	072-1	5	6
T8120023	072-2	5	17
T8120024	072-3	5	ND
T8120025	072-4	5	6
T8120026	072-5	5	ND
T8120027	072-6	5	ND
T8120028	072-7	5	17

MDL means Method Detection Limit
ND means None Detected

Approved by Dave E. [Signature] Date 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/14/89
DATE ANALYZED: 01/16/89
WORK ORDER #: 89084

Total Organic Halogens (TOX)
EPA Method 9020
ug/L (ppb)

<u>Sample Name</u>	<u>Lab Code</u>	<u>Estimated MDL</u>	<u>Measured Concentration</u>
T8120029	084-1	5	ND
T8120030	084-2	5	ND
T8120031	084-3	5	ND
T8120032	084-4	5	ND

MDL means Method Detection Limit
ND means None Detected

Approved by Dave Edelman, Jr. Date 2/10/89

COLUMBIA ANALYTICAL SERVICES, INC.

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/12,13/89
DATE ANALYZED: 01/17/89
WORK ORDER #: 89072

QA/QC REPORT

TOX Method Blank Summary
EPA Method 9020
ug/L (ppb)

<u>Date</u>	<u>MDL</u>	<u>Measured Concentration</u>
1/17/89	5	ND

MDL means Method Detection Limit
ND means None Detected

Approved by Dave Solomon Date 2/13/89

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE COLLECTED: 01/14/89
DATE RECEIVED: 01/18/89
WORK ORDER #: 89084

QA/QC REPORT

TOX Method Blank Summary
EPA Method 9020
ug/L (ppb)

<u>Date</u>	<u>Estimated MDL</u>	<u>Measured Concentration</u>
01/18/89	5	ND

MDL means Method Detection Limit
ND means None Detected

Approved by Dave Edelman Date 2/10/89



ecology and environment, inc.

101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537

International Specialists in the Environment

MEMORANDUM

DATE: March 1, 1989

TO: John Roland, TATM-Project Manager, E & E, Seattle, WA

FROM: Doug Gresham, TATM-Chemist, E & E, Seattle, WA *DG*

THRU: Michael Bray, TATM-Chemist, E & E, Seattle, WA *MB*

SUBJ: PCB Data Quality Assurance Review, TOSCO Corporation-Spokane Terminal

REF: TDD: T10-8812-006
PAN: TWA-0256-AAA

The quality assurance review of two water samples collected at the TOSCO Corporation site in Spokane, Washington has been completed. PCB organic analyses were performed by Columbia Analytical Services, Inc., Longview, Washington.

The water samples were numbered: T8120022 and T8120023.

Data Qualifications:

I Sample Holding Time: Acceptable.

Both samples were extracted within seven days from the date of collection, and analyzed within 40 days from the date of extraction.

II Calibration: Acceptable.

- 1) Initial Calibration: Data not available.
- 2) Analytical Sequence: Acceptable.
- 3) Continuing Calibration: Acceptable.

The lab analyzed two standards (Aroclor 1248 and 1260) with the samples. The chromatogram verified the fingerprint and peak ratio of the standards was accurate. However, the comparison of calibration factors for the initial calibration standards could not be performed.

The lab analyzed an EPA performance evaluation standard (WP 185) of Aroclor 1248 with a true value of 50 ppb. The lab reported 44.2 ppb which is within the accepted range of recoveries. The fingerprint of retention times and peak ratios was acceptable.

III Method Blank: Acceptable.

There were no contaminants in the method blank above the instrument detection limit of 0.1 ug/l.

IV Surrogate Recoveries: Data not available.

V Matrix Spike/Matrix Spike Duplicate: Acceptable.

The lab spiked sample number T8120023 with aroclor 1248. The percent recovery (88.4%) was within the accepted control limits based on pesticides analyses.

VI Compound Identification: Acceptable.

There were no positive results in which to determine if the lab made the correct identification of PCB's in the samples.

The lab analyzed sample number T8120023 before and after a mercury cleanup step and the chromatograms did not show any PCB's present.

VII Compound Quantitation and Reported Detection Limits: Acceptable.

There were no positive results in which to determine if the lab calculated the PCB concentrations correctly. The lab calculated the detection limit correctly, by accounting for sample volumes, dilutions and splits from cleanup steps.

VIII Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses" section on "Pesticides Procedure" (February, 1988).

Based upon the information provided, the data is acceptable for use.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/12/89
DATE EXTRACTED: 01/16/89
DATE ANALYZED: 01/20/89
WORK ORDER #: 89072

PCB Analyses
EPA Methods 3510/8080
ug/L (ppb)

Sample Name: T8120022 T8120023
Lab Code: 072-1 072-2

	Estimated MDL		
Aroclor:			
1016	0.1	ND	ND
1221	0.1	ND	ND
1232	0.1	ND	ND
1242	0.1	ND	ND
1248	0.1	ND	ND
1254	0.1	ND	ND
1260	0.1	ND	ND
Total Aroclors	0.1	ND	ND

MDL means Method Detection Limit
ND means None Detected

Approved by: David S. L. [Signature] Date: 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/12/89
DATE EXTRACTED: 01/16/89
DATE ANALYZED: 01/20/89
WORK ORDER #: 89072

QA/QC REPORT

PCB Analyses
EPA Methods 3510/8080
ug/L (ppb)

Sample Name:

Method Blank

Lab Code:

072-MB

	<u>Estimated MDL</u>	
Aroclor:		
1016	0.1	ND
1221	0.1	ND
1232	0.1	ND
1242	0.1	ND
1248	0.1	ND
1254	0.1	ND
1260	0.1	ND
Total Aroclors	0.1	ND

MDL means Method Detection Limit
ND means None Detected

Approved by: Dave Salinas Date: 2/13/89



ecology and environment, inc.

101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537

International Specialists in the Environment

MEMORANDUM

DATE: March 1, 1989

TO: John Roland, TATM-Project Manager, E & E, Seattle, WA

FROM: Doug Gresham, TATM-Chemist, E & E, Seattle, WA *DC*

THRU: Michael Bray, TATM-Chemist, E & E, Seattle, WA *MB*

SUBJ: Volatile Organic Data Quality Assurance Review, TOSCO Corporation-Spokane Terminal

REF: TDD: T10-8812-006
PAN: TWA-0256-AAA

The quality assurance review of 11 water samples collected at the TOSCO Corporation site in Spokane, Washington has been completed. Volatile organic analyses were performed by Columbia Analytical Services, Inc., Longview, Washington.

The water samples were numbered: T8120022 through T8120032.

Data Qualifications:

I Holding Time: Acceptable.

All the samples were analyzed within seven days from the date of collection.

II GC/MS Tuning: Acceptable.

All ion abundance criteria were within the accepted control limits.

III Calibration:

1. Initial Calibration:

a) Average Relative Response Factors: Acceptable. All compounds were greater than 0.05.

- b) Percent Relative Standard Deviation: All compounds were less than 30%, except for methylene chloride (31.5%). There were no positive results for methylene chloride, therefore it is the professional judgement of this reviewer that the data are acceptable.

2. Continuing Calibration:

- a) Relative Response Factors: All the compounds were greater than 0.05, except for 2-Chloroethylvinyl ether (0.012, 0.008, 0.012, 0.011). All sample quantitation limits for this compound are flagged (R) as unusable.
- b) Percent Difference: Acceptable. A spot check of 10% of the results verified that all the values were less than 25%, which is acceptable.

IV Blanks:

A. Method Blanks:

The lab reported the results for two method blanks analyzed with the samples on 1-16-89 and 1-18-89. All method blank concentrations were less than the instrument detection limit, except for methylene chloride (1.6 ug/l) in the blank analyzed on 1-16-89. There were two samples numbered T8120024 and T8120025 associated with this blank. For these two samples the instrument detection limit for methylene chloride is 10X the blank concentration (i.e. 16 ug/l) and will be flagged (U) as non-detected.

B. Transport Blanks: Acceptable.

Sample number T8120022 was submitted to the lab as a transport blank. All the results were reported as non-detected, which is acceptable.

C. Transfer Blanks: Acceptable.

Samples numbered T8120027, T8120029 and T8120031 were submitted to the lab as transfer blanks. All the results were reported as non-detected, which is acceptable.

V Surrogate Recovery: Acceptable.

VI Matrix Spike/Matrix Spike Duplicates: Acceptable.

The lab spiked sample number T8120029 and all the percent recoveries were within the control limits. The relative percent difference values between the recoveries, were all below the control limits.

VII Field Duplicates: Acceptable.

Blind duplicate samples numbered T8120024 and T8120025 were submitted to the lab. All the results were reported as non-detected, therefore, the relative percent difference between values could not be calculated.

VIII Internal Standard Performance: Data not available.

IX TCL Compound Identification: Acceptable.

The lab did not provide quantitation lists to determine if all relative retention times of positive results were within 0.06 units of the standard. A review of the chromatograms verified that all positive results were identified correctly using the relative ion intensities of the standards.

X Compound Quantitation and Reported Detection Limits:

Data not available.

XI Tentatively Identified Compounds: Data not available.

XII System Performance: Acceptable.

XIII Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses" (February, 1988).

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

- R - Indicates gross deficiencies occurred in the quality control criteria making the data unusable.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

CLIENT: Ecology & Environment
 SUBMITTED BY: John Roland
 PROJECT: Case #T10-8810-013
 SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/12/89
 DATE ANALYZED: 01/13/89
 WORK ORDER #: 89072

EPA Volatile Priority Pollutant Analysis

EPA Method 8240

ug/L (ppb)

Compound	Estimated MDL	Sample Name: Lab Code:	T8120022 072-1	T8120023 072-2
Chloromethane	1		ND	ND
Vinyl Chloride	1		ND	ND
Bromomethane	1		ND	ND
Chloroethane	1		ND	ND
Trichlorofluoromethane	1		ND	ND
1,1-Dichloroethene	1		ND	ND
Acetone	10		ND	ND
Carbon Disulfide	1		ND	ND
Methylene Chloride	5		ND	ND
Trans 1,2-Dichloroethene	1		ND	ND
2-Butanone (MEK)	10		ND	ND
1,1-Dichloroethane	1		ND	ND
Chloroform	1		ND	ND
1,1,1-Trichloroethane	1		ND	ND
Carbon Tetrachloride	1		ND	ND
Benzene	1		ND	19
1,2-Dichloroethane	1		ND	3.5
Vinyl Acetate	10		ND	ND
Trichloroethene	1		ND	ND
1,2-Dichloropropane	1		ND	ND
Bromodichloromethane	1		ND	ND
2-Chloroethylvinyl ether	10 R		ND R	ND R
Trans 1,3-Dichloropropene	1		ND	ND
2-Hexanone	10		ND	ND
4-Methyl-2-Pentanone (MIBK)	10		ND	ND
Toluene	1		ND	19
Cis 1,3-Dichloropropene	1		ND	ND
1,1,2-Trichloroethane	1		ND	ND
Tetrachloroethene	1		ND	ND
Dibromochloromethane	1		ND	ND
Chlorobenzene	1		ND	ND
Ethylbenzene	1		ND	7.1
Styrene	1		ND	ND
Total Xylenes	1		ND	82
Bromoform	1		ND	ND
1,1,2,2-Tetrachloroethane	1		ND	ND
1,3-Dichlorobenzene	1		ND	ND
1,4-Dichlorobenzene	1		ND	ND
1,2-Dichlorobenzene	1		ND	ND

MDL means Method Detection Limit

ND means None Detected

Approved by Dave SullivanDate 2/13/89

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/12/89
DATE ANALYZED: 01/16/89
WORK ORDER #: 89072

EPA Volatile Priority Pollutant Analysis
EPA Method 8240
ug/L (ppb)

Compound	Estimated	Sample Name:	T8120024	T8120025
	MDL	Lab Code:	072-3	072-4
Chloromethane	1		ND	ND
Vinyl Chloride	1		ND	ND
Bromomethane	1		ND	ND
Chloroethane	1		ND	ND
Trichlorofluoromethane	1		ND	ND
1,1-Dichloroethene	1		ND	ND
Acetone	10		ND	ND
Carbon Disulfide	1		ND	ND
Methylene Chloride	8 16 U		ND 16 U	ND 16 U
Trans 1,2-Dichloroethene	1		ND	ND
2-Butanone (MEK)	10		ND	ND
1,1-Dichloroethane	1		ND	ND
Chloroform	1		ND	ND
1,1,1-Trichloroethane	1		ND	ND
Carbon Tetrachloride	1		ND	ND
Benzene	1		ND	ND
1,2-Dichloroethane	1		ND	ND
Vinyl Acetate	10		ND	ND
Trichloroethene	1		ND	ND
1,2-Dichloropropane	1		ND	ND
Bromodichloromethane	1		ND	ND
2-Chloroethylvinyl ether	10 R		ND R	ND R
Trans 1,3-Dichloropropene	1		ND	ND
2-Hexanone	10		ND	ND
4-Methyl-2-Pentanone (MIBK)	10		ND	ND
Toluene	1		ND	ND
Cis 1,3-Dichloropropene	1		ND	ND
1,1,2-Trichloroethane	1		ND	ND
Tetrachloroethene	1		ND	ND
Dibromochloromethane	1		ND	ND
Chlorobenzene	1		ND	ND
Ethylbenzene	1		ND	ND
Styrene	1		ND	ND
Total Xylenes	1		ND	ND
Bromoform	1		ND	ND
1,1,2,2-Tetrachloroethane	1		ND	ND
1,3-Dichlorobenzene	1		ND	ND
1,4-Dichlorobenzene	1		ND	ND
1,2-Dichlorobenzene	1		ND	ND

MDL means Method Detection Limit

ND means None Detected

Approved by Deane E. L. ...

Date 2/13/89

CLIENT: Ecology & Environment
 SUBMITTED BY: John Roland
 PROJECT: Case #T10-8810-013
 SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/12-13/89
 DATE ANALYZED: 01/13/89
 WORK ORDER #: 89072

EPA Volatile Priority Pollutant Analysis
 EPA Method 8240
 ug/L (ppb)

Compound	Estimated MDL	Sample Name: Lab Code:	T8120026 072-5	T8120027 072-6	T8120028 072-7
Chloromethane	1		ND	ND	ND
Vinyl Chloride	1		ND	ND	ND
Bromomethane	1		ND	ND	ND
Chloroethane	1		ND	ND	ND
Trichlorofluoromethane	1		ND	ND	ND
1,1-Dichloroethene	1		ND	ND	ND
Acetone	10		ND	ND	ND
Carbon Disulfide	1		ND	ND	ND
Methylene Chloride	5		ND	ND	ND
Trans 1,2-Dichloroethene	1		ND	ND	ND
Cis 1,2-Dichloroethene	1		ND	ND	ND
2-Butanone (MEK)	10		ND	ND	ND
1,1-Dichloroethane	1		ND	ND	ND
Chloroform	1		ND	ND	ND
1,1,1-Trichloroethane	1		ND	ND	ND
Carbon Tetrachloride	1		ND	ND	ND
Benzene	1		ND	ND	ND
1,2-Dichloroethane	1		ND	ND	ND
Vinyl Acetate	10		ND	ND	ND
Trichloroethene	1		ND	ND	ND
1,2-Dichloropropane	1		ND	ND	ND
Bromodichloromethane	1		ND	ND	ND
2-Chloroethylvinyl ether	10 R		ND R	ND R	ND R
Trans 1,3-Dichloropropene	1		ND	ND	ND
2-Hexanone	10		ND	ND	ND
4-Methyl-2-Pentanone (MIBK)	10		ND	ND	ND
Toluene	1		ND	ND	ND
Cis 1,3-Dichloropropene	1		ND	ND	ND
1,1,2-Trichloroethane	1		ND	ND	ND
Tetrachloroethene	1		ND	ND	ND
Dibromochloromethane	1		ND	ND	ND
Chlorobenzene	1		ND	ND	ND
Ethylbenzene	1		ND	ND	ND
Styrene	1		ND	ND	ND
Total Xylenes	1		ND	ND	ND
Bromoform	1		ND	ND	ND
1,1,2,2-Tetrachloroethane	1		ND	ND	ND
1,3-Dichlorobenzene	1		ND	ND	ND
1,4-Dichlorobenzene	1		ND	ND	ND
1,2-Dichlorobenzene	1		ND	ND	ND

MDL means Method Detection Limit

ND means None Detected

Approved by Dave Sullivan Date 2/13/89

CLIENT: Ecology & Environment
 SUBMITTED BY: John Roland
 PROJECT: Case #T10-8810-013
 SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/12/89
 DATE ANALYZED: 01/16/89
 WORK ORDER #: 89072

QA/QC REPORT

EPA Volatile Priority Pollutant Analysis

EPA Method 8240

ug/L (ppb)

Compound	Estimated MDL	Method Blank
Chloromethane	1	ND
Vinyl Chloride	1	ND
Bromomethane	1	ND
Chloroethane	1	ND
Trichlorofluoromethane	1	ND
1,1-Dichloroethene	1	ND
Acetone	10	ND
Carbon Disulfide	1	ND
Methylene Chloride	1	1.6
Trans 1,2-Dichloroethene	1	ND
2-Butanone (MEK)	10	ND
1,1-Dichloroethane	1	ND
Chloroform	1	ND
1,1,1-Trichloroethane	1	ND
Carbon Tetrachloride	1	ND
Benzene	1	ND
1,2-Dichloroethane	1	ND
Vinyl Acetate	10	ND
Trichloroethene	1	ND
1,2-Dichloropropane	1	ND
Bromodichloromethane	1	ND
2-Chloroethylvinyl ether	10	ND R
Trans 1,3-Dichloropropene	1	ND
2-Hexanone	10	ND
4-Methyl-2-Pentanone (MIBK)	10	ND
Toluene	1	ND
Cis 1,3-Dichloropropene	1	ND
1,1,2-Trichloroethane	1	ND
Tetrachloroethene	1	ND
Dibromochloromethane	1	ND
Chlorobenzene	1	ND
Ethylbenzene	1	ND
Styrene	1	ND
Total Xylenes	1	ND
Bromoform	1	ND
1,1,2,2-Tetrachloroethane	1	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND

MDL means Method Detection Limit

ND means None Detected

Approved by Dave SullivanDate 2/13/89

CLIENT: Ecology & Environment
 SUBMITTED BY: John Roland
 PROJECT: Case #T10-8810-013
 SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/14/89
 DATE ANALYZED: 01/18/89
 WORK ORDER #: 89084

EPA Volatile Priority Pollutant Analysis
 EPA Method 8240
 ug/L (ppb)

Compound	Estimated	Sample Name:	T8120029	T8120030
	MDL	Lab Code:	084-1	084-2
Chloromethane	1		ND	ND
Vinyl Chloride	1		ND	ND
Bromomethane	1		ND	ND
Chloroethane	1		ND	ND
Trichlorofluoromethane	1		ND	ND
1,1-Dichloroethene	1		ND	ND
Acetone	10		ND	ND
Carbon Disulfide	1		ND	ND
Methylene Chloride	3		ND	ND
Trans 1,2-Dichloroethene	1		ND	ND
2-Butanone (MEK)	10		ND	ND
1,1-Dichloroethane	1		ND	ND
Chloroform	1		ND	ND
1,1,1-Trichloroethane	1		ND	ND
Carbon Tetrachloride	1		ND	ND
Benzene	1		ND	ND
1,2-Dichloroethane	1		ND	ND
Vinyl Acetate	10		ND	ND
Trichloroethene	1		ND	ND
1,2-Dichloropropane	1		ND	ND
Bromodichloromethane	1		ND	ND
2-Chloroethylvinyl ether	10 R		ND R	ND R
Trans 1,3-Dichloropropene	1		ND	ND
2-Hexanone	10		ND	ND
4-Methyl-2-Pentanone (MIBK)	10		ND	ND
Toluene	1		ND	ND
Cis 1,3-Dichloropropene	1		ND	ND
1,1,2-Trichloroethane	1		ND	ND
Tetrachloroethene	1		ND	ND
Dibromochloromethane	1		ND	ND
Chlorobenzene	1		ND	ND
Ethylbenzene	1		ND	ND
Styrene	1		ND	ND
Total Xylenes	1		ND	ND
Bromoform	1		ND	ND
1,1,2,2-Tetrachloroethane	1		ND	ND
1,3-Dichlorobenzene	1		ND	ND
1,4-Dichlorobenzene	1		ND	ND
1,2-Dichlorobenzene	1		ND	ND

MDL means Method Detection Limit

ND means None Detected

Approved by Dave Shelman

Date 2/10/89

CLIENT: Ecology & Environment
 SUBMITTED BY: John Roland
 PROJECT: Case #T10-8810-013
 SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/14/89
 DATE ANALYZED: 01/19/89
 WORK ORDER #: 89084

EPA Volatile Priority Pollutant Analysis

EPA Method 8240

ug/L (ppb)

Compound	Estimated MDL	Sample Name: T8120031 Lab Code: 084-3	T8120032 084-4
Chloromethane	1	ND	ND
Vinyl Chloride	1	ND	ND
Bromomethane	1	ND	ND
Chloroethane	1	ND	ND
Trichlorofluoromethane	1	ND	ND
1,1-Dichloroethene	1	ND	ND
Acetone	10	ND	ND
Carbon Disulfide	1	ND	ND
Methylene Chloride	3	ND	ND
Trans 1,2-Dichloroethene	1	ND	ND
2-Butanone (MEK)	10	ND	ND
1,1-Dichloroethane	1	ND	ND
Chloroform	1	ND	ND
1,1,1-Trichloroethane	1	ND	ND
Carbon Tetrachloride	1	ND	ND
Benzene	1	ND	ND
1,2-Dichloroethane	1	ND	ND
Vinyl Acetate	10	ND	ND
Trichloroethene	1	ND	ND
1,2-Dichloropropane	1	ND	ND
Bromodichloromethane	1	ND	ND
2-Chloroethylvinyl ether	10 R	ND R	ND R
Trans 1,3-Dichloropropene	1	ND	ND
2-Hexanone	10	ND	ND
4-Methyl-2-Pentanone (MIBK)	10	ND	ND
Toluene	1	ND	ND
Cis 1,3-Dichloropropene	1	ND	ND
1,1,2-Trichloroethane	1	ND	ND
Tetrachloroethene	1	ND	ND
Dibromochloromethane	1	ND	ND
Chlorobenzene	1	ND	ND
Ethylbenzene	1	ND	ND
Styrene	1	ND	ND
Total Xylenes	1	ND	ND
Bromoform	1	ND	ND
1,1,2,2-Tetrachloroethane	1	ND	ND
1,3-Dichlorobenzene	1	ND	ND
1,4-Dichlorobenzene	1	ND	ND
1,2-Dichlorobenzene	1	ND	ND

MDL means Method Detection Limit

ND means None Detected

Approved by Dave EdelmanDate 2/10/89

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE RECEIVED: 01/14/89
DATE ANALYZED: 01/18/89
WORK ORDER #: 89084

EPA Volatile Priority Pollutant Analysis
EPA Method 8240
ug/L (ppb)

Compound	Estimated MDL	Sample Name: Lab Code:	Method Blank 084-MB
Chloromethane	1		ND
Vinyl Chloride	1		ND
Bromomethane	1		ND
Chloroethane	1		ND
Trichlorofluoromethane	1		ND
1,1-Dichloroethene	1		ND
Acetone	10		ND
Carbon Disulfide	1		ND
Methylene Chloride	3		ND
Trans 1,2-Dichloroethene	1		ND
2-Butanone (MEK)	10		ND
1,1-Dichloroethane	1		ND
Chloroform	1		ND
1,1,1-Trichloroethane	1		ND
Carbon Tetrachloride	1		ND
Benzene	1		ND
1,2-Dichloroethane	1		ND
Vinyl Acetate	10		ND
Trichloroethene	1		ND
1,2-Dichloropropane	1		ND
Bromodichloromethane	1		ND
2-Chloroethylvinyl ether	10 R		ND R
Trans 1,3-Dichloropropene	1		ND
2-Hexanone	10		ND
4-Methyl-2-Pentanone (MIBK)	10		ND
Toluene	1		ND
Cis 1,3-Dichloropropene	1		ND
1,1,2-Trichloroethane	1		ND
Tetrachloroethene	1		ND
Dibromochloromethane	1		ND
Chlorobenzene	1		ND
Ethylbenzene	1		ND
Styrene	1		ND
Total Xylenes	1		ND
Bromoform	1		ND
1,1,2,2-Tetrachloroethane	1		ND
1,3-Dichlorobenzene	1		ND
1,4-Dichlorobenzene	1		ND
1,2-Dichlorobenzene	1		ND

MDL means Method Detection Limit
ND means None Detected

Approved by Don Salmon

Date 2/13/89



ecology and environment, inc.

101 YESLER WAY, SEATTLE, WASHINGTON, 98104, TEL. 206/624-9537

International Specialists in the Environment

MEMORANDUM

DATE: March 1, 1989

TO: John Roland, TATM-Project Manager, E & E, Seattle, WA

FROM: Doug Gresham, TATM-Chemist, E & E, Seattle, WA DG

THRU: Michael Bray, TATM-Chemist, E & E, Seattle, WA MA

SUBJ: Semi-volatile Organic Data Quality Assurance Review, TOSCO Corporation-Spokane Terminal

REF: TDD: T10-8812-006
PAN: TWA-0256-AAA

The quality assurance review of 11 water samples collected at the TOSCO Corporation site in Spokane, Washington has been completed. Semi-volatile organic analyses were performed by Columbia Analytical Services, Inc., Longview, Washington.

The water samples were numbered: T8120022 through T8120032.

Data Qualifications:

I Holding Time:

All the samples were extracted within seven days from the date of collection, except for sample number T8120022. All sample quantitation limits for this sample are flagged (UJ) as estimated. All the sample extracts were analyzed within 40 days from the date of extraction.

II GC/MS Tuning: Acceptable.

All ion abundance criteria were within the accepted control limits.

III Calibration:

1. Initial Calibration:

- a) Average Relative Response Factors: All results were greater than 0.05, except for benzidine (0.029). All sample quantitation limits for benzidine are flagged (R) as unusable.

- b) Percent Relative Standard Deviation: All results were less than 30%, except for the following compounds: 4-Nitrophenol (34.04%); Diethylphthalate (30.1%); and 4-Chlorophenyl-phenylether (37.34%). There were no positive results for these compounds, and it is the professional judgement of this reviewer that the data are acceptable.

2. Continuing Calibration:

- a) Relative Response Factors: All results were greater than 0.05, except for benzidine. The results for benzidine are already qualified, therefore no action is required.
- b) Percent Difference: Acceptable. A spot check of 10% of the response factors verified that the results were less than 25%, which is acceptable.

IV Blanks:

A. Method Blanks:

The lab analyzed a method blank that was extracted on 1-18-89 with samples numbered T8120029 through T8120032. All the results were reported as non-detected, which is acceptable.

B. Transport Blanks: Acceptable.

Sample number T8120022 was submitted to the lab as a transport blank. All the results were reported as non-detected, which is acceptable.

C. Transfer Blanks: Acceptable.

Samples numbered T8120027, T8120029 and T8120031 were submitted to the lab as transfer blanks. All the results were reported as non-detected, which is acceptable.

V Surrogate Recovery: Acceptable.

VI Matrix Spike/Matrix Spike Duplicates: Acceptable.

The lab spiked sample number T8120028 and all the percent recoveries were within the control limits. The relative percent difference values between the recoveries, were all below the control limits.

VII Field Duplicates: Acceptable.

Blind duplicate samples numbered T8120024 and T8120025 were submitted to the lab. All the results were reported as non-detected, therefore, the relative percent difference between values could not be calculated.

VIII Internal Standard Performance: Data not available.

IX TCL Compound Identification: Acceptable.

The lab did not provide quantitation lists to determine if all relative retention times of positive results were within 0.06 units of the standard. A review of the chromatograms verified that all positive results were identified correctly using the relative ion intensities of the standards .

X Compound Quantitation and Reported Detection Limits:

Data not available.

XI Tentatively Identified Compounds: Data not available.

XII System Performance: Acceptable.

XIII Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in "Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses" (February, 1988).

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

- J - Indicates an estimated value. This flag is used when either the result is below the specified detection limit, or the analysis does not meet quality control criteria.
- R - Indicates gross deficiencies occurred in the quality control criteria making the data unusable.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE COLLECTED: 01/09/89
DATE RECEIVED: 01/12/89
DATE EXTRACTED: 01/17/89
DATE ANALYZED: 02/01/89

EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)

SAMPLE NAME: T8120022
LAB CODE: 89072-1

REVIEWED BY: dic

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5 <u>uJ</u>	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy) methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 <u>uJ</u>	ND <u>R</u>

PARAMETER	MDL	ug/L
Phenanthrene	5 <u>uJ</u>	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20 <u>uJ</u>	ND

MDL means Method Detection Limit
ND means None Detected

Approved by Dave Sullivan

Date 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical ReportCLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: WaterDATE COLLECTED: 01/10/89
DATE RECEIVED: 01/12/89
DATE EXTRACTED: 01/17/89
DATE ANALYZED: 02/01/89EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)SAMPLE NAME: T8120023
LAB CODE: 89072-2REVIEWED BY: dl

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy) methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	15
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	17
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	6.1
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50	R-530-ND

PARAMETER	MDL	ug/L
Phenanthrene	5	8.3
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a) anthracene	5	ND
Bis(2-ethylhexyl) phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b) fluoranthene	5	ND
Benzo(k) fluoranthene	5	ND
Benzo(a) pyrene	5	ND
Indeno(1,2,3-c,d) pyrene	5	ND
Dibenzo(a,h) anthracene	5	ND
Benzo(g,h,i) perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None DetectedApproved by Dave SchinnererDate 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical ReportCLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: WaterDATE COLLECTED: 01/11/89
DATE RECEIVED: 01/12/89
DATE EXTRACTED: 01/17/89
DATE ANALYZED: 02/01/89EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)SAMPLE NAME: T8120024
LAB CODE: 89072-3REVIEWED BY: gle

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy)methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None DetectedApproved by Dev. ShumanDate 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical ReportCLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: WaterDATE COLLECTED: 01/11/89
DATE RECEIVED: 01/12/89
DATE EXTRACTED: 01/17/89
DATE ANALYZED: 02/01/89EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)SAMPLE NAME: T8120025
LAB CODE: 89072-4REVIEWED BY: alc

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy)methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None DetectedApproved by Dore E. SimonDate 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical ReportCLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: WaterDATE COLLECTED: 01/11/89
DATE RECEIVED: 01/12/89
DATE EXTRACTED: 01/17/89
DATE ANALYZED: 02/01/89EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)SAMPLE NAME: T8120026
LAB CODE: 89072-5REVIEWED BY: dlc

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy) methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None DetectedApproved by Dave SelimanDate 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical ReportCLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: WaterDATE COLLECTED: 01/12/89
DATE RECEIVED: 01/13/89
DATE EXTRACTED: 01/17/89
DATE ANALYZED: 02/01/89EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)SAMPLE NAME: T8120027
LAB CODE: 89072-6REVIEWED BY: dlc

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy) methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None DetectedApproved by Dave EdmistonDate 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE COLLECTED: 01/12/89
DATE RECEIVED: 01/13/89
DATE EXTRACTED: 01/17/89
DATE ANALYZED: 02/02/89

EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)

SAMPLE NAME: T8120028
LAB CODE: 89072-7

REVIEWED BY: alc

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy) methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None Detected

Approved by David S. Williams

Date 2/13/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE COLLECTED: 01/12/89
DATE RECEIVED: 01/14/89
DATE EXTRACTED: 01/18/89
DATE ANALYZED: 02/02/89

EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)

SAMPLE NAME: T8120029
LAB CODE: 89084-1

REVIEWED BY: de

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy) methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None Detected

Approved by Dave Zelman

Date 2/10/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical ReportCLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: WaterDATE COLLECTED: 01/12/89
DATE RECEIVED: 01/14/89
DATE EXTRACTED: 01/18/89
DATE ANALYZED: 02/02/89EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)SAMPLE NAME: T8120030
LAB CODE: 89084-2REVIEWED BY: dle

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy)methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None DetectedApproved by Dave EdelmanDate 2/10/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical ReportCLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: WaterDATE COLLECTED: 01/12/89
DATE RECEIVED: 01/14/89
DATE EXTRACTED: 01/18/89
DATE ANALYZED: 02/02/89EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)SAMPLE NAME: T8120031
LAB CODE: 89084-3REVIEWED BY: de

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy)methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None DetectedApproved by Dave EdelmanDate 2/10/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical ReportCLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: WaterDATE COLLECTED: 01/12/89
DATE RECEIVED: 01/14/89
DATE EXTRACTED: 01/18/89
DATE ANALYZED: 02/02/89EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)SAMPLE NAME: T8120032
LAB CODE: 89084-4REVIEWED BY: de

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy)methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a)anthracene	5	ND
Bis(2-ethylhexyl)phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b)fluoranthene	5	ND
Benzo(k)fluoranthene	5	ND
Benzo(a)pyrene	5	ND
Indeno(1,2,3-c,d)pyrene	5	ND
Dibenzo(a,h)anthracene	5	ND
Benzo(g,h,i)perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None DetectedApproved by Dave Edelman, JDate 2/10/89

COLUMBIA ANALYTICAL SERVICES, INC.
Analytical Report

CLIENT: Ecology & Environment
SUBMITTED BY: John Roland
PROJECT: Case #T10-8810-013
SAMPLE DESCRIPTION: Water

DATE COLLECTED: 01/12/89
DATE RECEIVED: 01/14/89
DATE EXTRACTED: 01/18/89
DATE ANALYZED: 02/02/89

EPA Acid/Base Neutral Priority Pollutants
EPA Method 8270
ug/L (ppb)

LAB CODE: 89084-MB

REVIEWED BY: me

PARAMETER	MDL	ug/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) ether	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
1,2-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) ether	5	ND
N-Nitrosodi-n-propyl amine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-Chloroethoxy) methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethylphthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethylphthalate	5	ND
4-Chlorophenyl phenyl ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl phenyl ether	5	ND
Hexachlorobenzene	5	ND
Benzidine	50 R	ND

PARAMETER	MDL	ug/L
Phenanthrene	5	ND
Anthracene	5	ND
Dibutylphthalate	5	ND
Fluoranthene	5	ND
Pyrene	5	ND
Butyl benzyl phthalate	5	ND
3,3'-Dichlorobenzidine	5	ND
Benzo(a) anthracene	5	ND
Bis(2-ethylhexyl) phthalate	5	ND
Chrysene	5	ND
Di-n-octyl phthalate	5	ND
Benzo(b) fluoranthene	5	ND
Benzo(k) fluoranthene	5	ND
Benzo(a) pyrene	5	ND
Indeno(1,2,3-c,d) pyrene	5	ND
Dibenzo(a,h) anthracene	5	ND
Benzo(g,h,i) perylene	5	ND
Phenol	5	ND
2-Chlorophenol	5	ND
Benzyl Alcohol	5	ND
2-Methylphenol	5	ND
4-Methylphenol	5	ND
2-Nitrophenol	5	ND
2,4-Dimethylphenol	5	ND
Benzoic Acid	50	ND
2,4-Dichlorophenol	5	ND
4-Chloro-3-methylphenol	5	ND
2,4,6-Trichlorophenol	5	ND
2,4,5-Trichlorophenol	5	ND
2,4-Dinitrophenol	50	ND
4-Nitrophenol	50	ND
2-Methyl-4,6-dinitrophenol	20	ND
Pentachlorophenol	20	ND

MDL means Method Detection Limit
ND means None Detected

Approved by Don Edelman

Date 2/10/89



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MEMORANDUM

DATE: March 24, 1989

TO: Richard Fullner, TATL, E & E, Seattle, WA

FROM: John L. Roland, Geologist, E & E, Seattle, WA *SLR*

SUBJ: Tosco Corporation - Spokane Terminal Case Review and Removal Action Recommendations

REF: TDD: T10-8810-013

REMEDIAL INVESTIGATION DATA REVIEW

As part of the Tosco site assessment, it was necessary to conduct a review of the Golder Associates Remedial Investigation (RI) directed by the Washington State Department of Ecology (Ecology) to permit assimilation and interpretation of that data within the framework of the removal program. Golder Associates never submitted a final report on the investigation due to Ecology budgetary restrictions.

The data showed a complex distribution and source potential for the organic contaminants existing in soil and groundwater on the Tosco, and the adjacent Draper Tractor Parts properties. During the RI, seventy backhoe test pits were dug at depths not greater than approximately 10 feet. Of the pits located in the abandoned refinery waste pond area, significant zones of black, oily soil were identified at three pits locations (TP-1, TP-8 and TP-17), with visible contamination extending from basically the ground surface down to depths of at least 8.5 feet. Two other pits in the area (TP-6 and TP-18) showed from 4 to at least 6.5 feet of oily soil.

EPA Hazardous Substance List (HSL) volatile organic analytes identified in the soil included: benzene, ethylbenzene, toluene and xylenes. Base/neutral/acid (BNA) extractable compounds included: naphthalene, fluorine, phenanthrene and 2-methyl-naphthalene. All of these organics were also identified in groundwater sampled from monitoring well NM-4 located directly down gradient of the abandoned refinery waste pond area.

Examination of the drilling logs for deeper-probing soil borings and monitoring wells demonstrated that the vertical and lateral distribution of organic contamination in the vadose zone, and the aquifer, are not defined. Headspace organic vapor analyzer (OVA)

readings measured during the drilling work recorded organic soil-gas vapors in the hundred to thousand parts per million (ppm) range. Such readings were recorded at depths well below, as well as laterally away from, the observed visually contaminated oily soils of the abandoned waste ponds. Readings were reported at depths between 85 and 145 feet below ground surface (b.g.s.) and were not restricted to drilling locations positioned in the immediate proximity of the abandoned waste ponds. For example, strong OVA readings in excess of 1,000 ppm were noted at depths between 115 and 135 feet in boring B-4 located in the tank farm area, over 800 ft upgradient and east-southeast of the abandoned waste ponds.

Actual soil samples collected at selected depths from the drill holes were less informative than the OVA for detecting volatile organic contamination of the vadose zone. The lack of detection by these samples suggests that the sampler's were unable to successfully collect, containerize or preserve the samples to accurately quantify the volatile organics persisting in the unsaturated sediments. Drilling technique constraints may have been a significant limitation factor in this regard.

The test pit and drilling data generated by the RI indicate that the abandoned oil refinery waste ponds are serving as chronic point sources for the types of volatile and semi-volatile organic compounds identified in the aquifer. These contaminants contribute to soil gas volatile organic contamination of the vadose zone in the pond area.

In addition to the waste pond area there is evidence suggesting other contaminant sources potentially exist at the Tosco facility. The 50-year petroleum storage tank history of the property; the reported presence of significant volatile organic soil gas at depths in excess of 100 feet b.g.s.; and the downgradient position of monitoring well NM-4 to the tank farm show that the tank farm is also a suspect potential point source for the floating oil plume identified by Ecology in 1987. An investigation to identify potential spill point sources in the tank farm area would require an extensive study of the tank farm grounds.

A final potential contributor to soil and groundwater contamination near well NM-4 is the buried Chevron pipeline which approaches directly from the west and enters a meter station located on the Chevron property block. The potential for the pipeline to be a significant source of organic contamination is considered low at this time, but, to our knowledge, the system has not been formally investigated to date.

REMOVAL ACTION RECOMMENDATIONS

Determination of human health and environmental risks persisting at the Tosco facility focuses on the underlying Spokane Valley - Rathdrum Prairie Aquifer. Direct contact exposure concerns are considered minimal primarily because the waste pond area, as well as the entire facility, are secured by fencing.

Of the nine organic contaminants found in monitoring well NM-4 in January 1989, five have established drinking water Maximum Contaminant Level (MCL) standards as directed by the EPA. The most significant of these was benzene (20 ug/l) which exceeded its established MCL concentration (5 ug/l) by a factor of 4. These results should not be interpreted without qualifying that the water purged from well NM-4 at the time of sampling continued to contain small beads of free oil product, and that the Ecology sampling conducted in November 1987 encountered several inches of free product floating on the water table. The combined impact to the aquifer by contributions from the abandoned refinery waste ponds and potential historical, undocumented spills or leaks from the tank farm operations can be expected to persist for many years if not stabilized and remediated.

Abandoned Waste Pond Soils

Contaminants leaching from the waste pond area into the vadose zone, and downward to the water table can be rapidly controlled by initiating a stabilization effort aimed at significantly reducing the organics in the soil. Numerous proven, economically feasible options are available to mitigate hydrocarbon soil contamination, including biological methods, air stripping techniques, and enhanced recovery technology, to name a few. A removal action could be tailored to address the abandoned waste pond soils, to remove or reduce the most significant contaminants persisting in this point source area.

Contaminants Persisting in Groundwater

Groundwater contaminants which have potentially been released from the tank farm complex over the years must be more accurately defined and monitored. Additional monitoring wells installed immediately down gradient of the tank farm complex would assure early detection of potential product plumes so that rapid recovery techniques could be initiated before the velocity and permeability characteristics of the aquifer disperse the plume beyond recovery, as was the case in 1987.

In support of a formal on-site tank farm groundwater monitoring program, the monitoring wells installed by Ecology could be incorporated into the monitoring network to permit detection of additional potential product plumes originating along the western property boundary of Tosco. Additional monitoring stations along the western boundary of the abandoned waste pond area should also be considered. Due to the hydrodynamics of the aquifer, the monitoring program should operate on at least a quarterly schedule in an attempt to anticipate, detect and contain existing or future, plumes.

SUMMARY

For removal program purposes the treatment of contaminated groundwater detected in monitoring well NM-4 is anticipated to be both technically and economically feasible. More important though are the removal of recognized point sources, (i.e., the abandoned waste pond soils) and the detection and recovery of undetected product plumes or future spills through an enhanced groundwater monitoring well network.